Glenn Research Center

Smoldering Combustion in Microgravity

SCM/GBX/USML–1

NASA Glenn/UC–Berkeley

Smoldering Combustion

- Non-flaming surface combustion reaction that occurs within porous materials
- Encountered in charcoal briquettes, embers, and the smoking of tobacco products
- Characteristics of smolder and rate of propagation are controlled by the transport of (a) oxygen to the reaction zone, and (b) heat to and from the reaction zone

Hypothesis

- The near absence of buoyant convection in microgravity is expected to influence smoldering through its effect on the mass and heat transfer within the fuel sample

Objective

- To observe the smoldering characteristics of a porous combustible material (i.e., flexible polyurethane foam) in microgravity and normal gravity, with (a) quiescent air, and (b) forced convection (external to the fuel sample), in radial and axial smolder configurations

Relevance

- Smoldering fires are particularly dangerous because they can progress undetected for long periods, producing toxic gases (e.g., CO), and then suddenly change to flaming
- Information about smoldering combustion in microgravity may help in developing ways to prevent, detect, and extinguish smoldering fires in spacecraft and on Earth